PTO 06-4883

Chinese Patent

481,673

WATER SCRUBBING FURNACE SLAG TREATMENT METHOD

[Shuixishi Luzha Chuli Fangfa]

Chi-You Chung, Chi-Cheng Chung, Chi-Chiang Chung

UNITED STATES PATENT AND TRADEMARK OFFICE

Washington, D. C. June 2006

Translated by: Schreiber Translations, Inc.

Country	: Republic of China
Document No.	: 481673
Document Type	: Patent
Language	: Chinese
Inventor	: Chi-You Chung, Chi-Cheng Chung, Chi-Chiang Chung
Applicant	: Chi-You Chung, Chi-Cheng Chung, Chi-Chiang Chung
IPC	: C21B 3/04
Application Date	: December 30, 2000
Publication Date	: April 01, 2002
Foreign Language Title	: Shuixishi Luzha Chuli Fangfa
English Title	: Water Scrubbing Furnace Slag Treatment Method

[57] Abstract

This invention concerns a method for water scrubbing furnace slag treatment. According to the method, the furnace slag falls in the water scrubbing bolter via raw material hopper to screen out different sizes of slag. The slag of difference sizes is undergone magnetic cobber to screen residual steel. The large slag is crushed, undergone magnetic cobbing, dropped into grinder via secondary raw material hopper to grind, and retrieved to the raw material hopper for reprocessing. Due to the fact that the water scrubbing bolter has a water spraying system that can wash out the lime powder on the slag, that the small size slag is undergone water scrubbing and filtration after magnetic cobbing, and that the waster water after washing slag and sand can be precipitated to obtain fine material, this method can solve the problem of lime powder fly-up, avoid lime pollution to soil and underground water source, and thus solve the serious problem of illegal refilling of slag after treatment with traditional method.

[1] Numbers in the margin indicate pagination in the foreign text.

Instructions

This invention concerns a method for water scrubbing furnace slag treatment, especially a method for water scrubbing furnace slag treatment designed specifically for steelmaking slag processing. This invention provides a practical method of avoiding powder fly-up, avoiding lime pollution to soil and underground water source, and completely retrieving of furnace slag.

With post-processing techniques, the slag from steelmaking furnace can be processed into industrially valuable product meeting reuse requirement.

A complete set of steelmaking furnace slag post-processing technique can be divided into four processes: steelmaking furnace slag pre-treatment process, steelmaking slag processing process, steelmaking furnace slag maintenance process, and residual steel fine processing process. In the furnace slag post-processing industry, however, it is not necessary to follow all the four processes. Some processes can be endorsed or ignored as needed. The slag treatment method provided in this invention is designed specifically for steelmaking furnace slag processing process.

The steelmaking slag processing process is as follows: The furnace slag is undergone crushing, magnetic cobbing, and bolting to screen residual steel containing more than 55% iron. The residual steel is classified into standard slag satisfying reuse requirement for fine processing or direct use in sintering furnace, blast furnace, revolving furnace, or arc furnace. In addition, standard slag can be used as solvent for iron and steel smelting, cement raw material, soil amendment, as well as construction material for roads or gardens.

There are currently two slag treatment methods available:

In the first furnace slag treatment method as shown in Figure 2, the furnace slag is first dropped into a bucker via raw material hopper and crushed. The crushed slag is undergone magnetic cobber to screen iron-containing residual steel. The residual steel can be used as steelmaking raw material for iron and steel plant. The remaining furnace cinders are separated into graded batchers for road paving purpose. /4

When the furnace slag is taken out from the steelmaking furnace, it is imperative to cool down the slag first by spraying water. As such, the slag and the lime powder are adhered together, which cannot be separated using traditional magnetic cobbing or screening method. Furthermore, the water-contained slag and lime powder adhere and block

the screening net, thus affecting the operation efficiency and resulting in poor product quality.

Furthermore, during the steelmaking process, a variety of side raw materials have to be added into the steelmaking furnace, which contains substantial amount of burnt lime (limestone). As a result, the furnace slag also contains significant amount of lime powder. Lime is a strong alkaline substance with the Ph value of 10~11. The existing treatment method not only is unable to separate the lime powder from slag, but also causes lime powder to be mixed with graded batchers. As graded batchers are mostly applied for road paving, the lime powder will in turn undermine soil and affect the quality of underground water. In addition, the lime-contained slag can only be used as graded batchers and cannot be fully retrieved, which is a pity.

In the second furnace slag treatment method as shown in Figure 3, the furnace slag is first dropped into a drying machine via raw material hopper in order to dry up water contents absorbed by the slag during the cooling process. The slag is then crushed in a crushing machine and put in a magnetic cobber to extract residual iron-containing steel. The remaining slag is undergone a bolter to generate graded batchers.

With this treatment method, the slag is first dried up. As such, the slag can be divided into a variety of grades of batchers during the cobbing process. The method also solves the problem of slag and lime powder sticking and blocking screening net. However, this method has the following disadvantages:

1. The equipment is expensive. As the slag dry-up process may cause the rise of lime dust and air pollution, it is imperative to install additional pollution prevention equipment, in addition to the drying machine. As a result, the total equipment cost is very high. /5

2. The operating efficiency is low. With this treatment method, the slag must be dried up completely in order to screen the expected variety of graded batchers. As such, the material feed each time cannot be too much during the drying process. Otherwise, the process flow will be in stagnant and blocked, which affect the operating efficiency.

3. The method causes air pollution. Even though the pollution prevention and dust gathering equipment is set up, this treatment method can only reduce the micro dust in the air to the level below the standard, but is unable to completely eliminate the dust rise problem.

4. The maintenance cost is high. In addition to equipment cost, the cost for routine repair, maintenance, operation and supply of pollution prevention equipment and drying machine is very high, which, in consideration of high rate of equipment breakdown, will result in additional maintenance expense.

In view of the above discussions, the inventors designed a method for water scrubbing slag treatment in order to provide a practical way of avoiding dust fly-up, avoiding lime pollution to soil and underground water source, and completely retrieving and reusing furnace slag.

The main objective of this invention is to provide a method for water scrubbing furnace slag treatment designed specifically for steelmaking furnace slag processing. According to the method, the furnace slag falls in the water scrubbing bolter via raw material hopper to screen out different sizes of slag. The slag of difference sizes is undergone magnetic cobber to screen residual steel. The large slag is crushed, undergone magnetic cobbing, dropped into grinder via secondary raw material hopper to grind, and retrieved to the raw material hopper for reprocessing. Due to the fact that the water scrubbing bolter has a water spraying system that can wash out the lime powder on the slag, that the small size slag is undergone water

scrubbing and filtration after magnetic cobbing, and that the waster water after washing slag and sand can be precipitated to obtain fine material, this method can solve the problem of lime powder fly-up, avoid lime pollution to soil and underground water source, and thus solve the serious problem of illegal refilling of slag after treatment with traditional method. /6

In order for the Evaluation Committee to further understand the equipment treatment method and flow of this invention, detailed explanations with figures are provided as follows:

(1) Figures:

Figure 1 is a diagram of process flow of this invention.

Figure 2 is a diagram of process flow of the first known method.

Figure 3 is a diagram of process flow of the second known method.

This invention concerns a method for water scrubbing furnace slag treatment, which is designed specifically for steelmaking furnace slag processing. The treatment method flow is shown in Figure 1.

First, the slag is dropped into the water scrubbing bolter via raw material hopper. Inside the water scrubbing bolter are multi-layer screening nets and water spraying system. The screening nets are arranged from top to bottom in the order from large mesh to small

mesh so that the slag first passes large mesh screening net. The nets screen four different sizes of slag, namely over 30mm slag, 12~30mm slag, 8~12mm slag, and below 8mm slag. During the screening process, the water spraying system constantly sprays water in order to wash away the lime powder mixed with furnace slag. The water that washed slag and contains lime powder flows back to the precipitation pool.

Furthermore, the slag of the four sizes is dropped in magnetic cobber to screen iron-containing residual steel, which can be used as raw material for steel smelting in iron and steel plant.

After magnetic cobbing, the remaining substances of 12~30mm slag are 3cm stones and 6cm stones. The 3cm and 6cm stones can be used as A.C. framework material. The remaining substances of 8~12mm slag are 2cm stones. 2cm stones can also be used as A. C. framework material. /7

The slag in the size of less than 8mm must be resent to the sand washing machine to filter out the sand in water through water scrubbing. The sand can be used as raw material for cement product, pedestrian lane bricks, hollow bricks, and ground tiles. The water that washed sand has to flow back to the precipitation pool to precipitate. Since the water contains lime powder, fine substance will be deposited on the bottom of the precipitation pool after a

while. The fine substance can be used as cement raw material. The precipitated water in the precipitation pool is inducted into a water reserve tank, where it can be recycled for use by the water spraying system of the water scrubbing bolter.

The slag in the size of over 30mm is undergone magnetic cobbing and then dropped into a jaw crushing machine to break up into pieces. It is then put in magnetic cobber to screen iron-containing residual steel. The slag is then put in a grinding machine through the secondary raw material hopper, where it is grinded and sent back to the raw material hopper for one more time treatment.

With the above-mentioned design, the water scrubbing slag treatment method provided in this invention offers the following advantages:

1. The method has avoided the rise of micro dust. At the time the slag is dropped into the water scrubbing bolter via the raw material hopper, the water spraying system in the bolter will wash away the lime powder first. As such, in the follow-up slag transfer, crushing, and magnetic cobbing procedures, the problem of lime powder rise is eliminated.

2. The slag can be completely retrieved. At the time the slag is dropped into the water scrubbing bolter via the raw material hopper,

the water spraying system in the bolter will wash away the lime powder first. With the precipitation procedure, the lime powder is precipitated as fine material that can be used as cement raw material. This way, more variety of standard slag can be produced. /8

3. This method has no damage to soil and the quality of underground water. At the time the slag is dropped into the water scrubbing bolter via the raw material hopper, the water spraying system in the bolter will wash away the lime powder first. As such, the lime powder can be completely separated and used as cement raw material. As a result, the lime content in graded batchers used for road paving is reduced, which can avoid damaging the soil quality and the quality of underground water.

In summary, the method for water scrubbing slag treatment provided in this invention has the above-mentioned advantages. It is a creative idea that is not available in the past designs. It also meets the key requirements for patent application. As such, this application is submitted. /9

Claims

What is claimed is:

A method for water scrubbing slag treatment, whereas the slag is first dropped into water scrubbing bolter via raw material hopper. The water scrubbing hopper screens four sizes of slag, namely over 30mm slag, 12~30mm slag, 8~12mm slag, and below 8mm slag. The slag of the four sizes is dropped in magnetic cobber to screen iron-containing residual steel. The slag in the size of over 30mm is undergone magnetic cobbing and then dropped into a jaw crushing machine to break up into pieces. It is then put in magnetic cobber to screen iron-containing residual steel. The slag is then put in a grinding machine through the secondary raw material hopper, where it is grinded and sent back to the raw material hopper for one more time treatment.

The water scrubbing bolter has a water spraying system that can spray water to slag. The slag in the size of less than 8mm has to be sent to the sand washing machine after magnetic cobbing, where the sand is filtered out. The water that washed the sand flows back to the precipitation pool where fine substance is precipitated. The water is then recycled to the water spraying system for reuse.

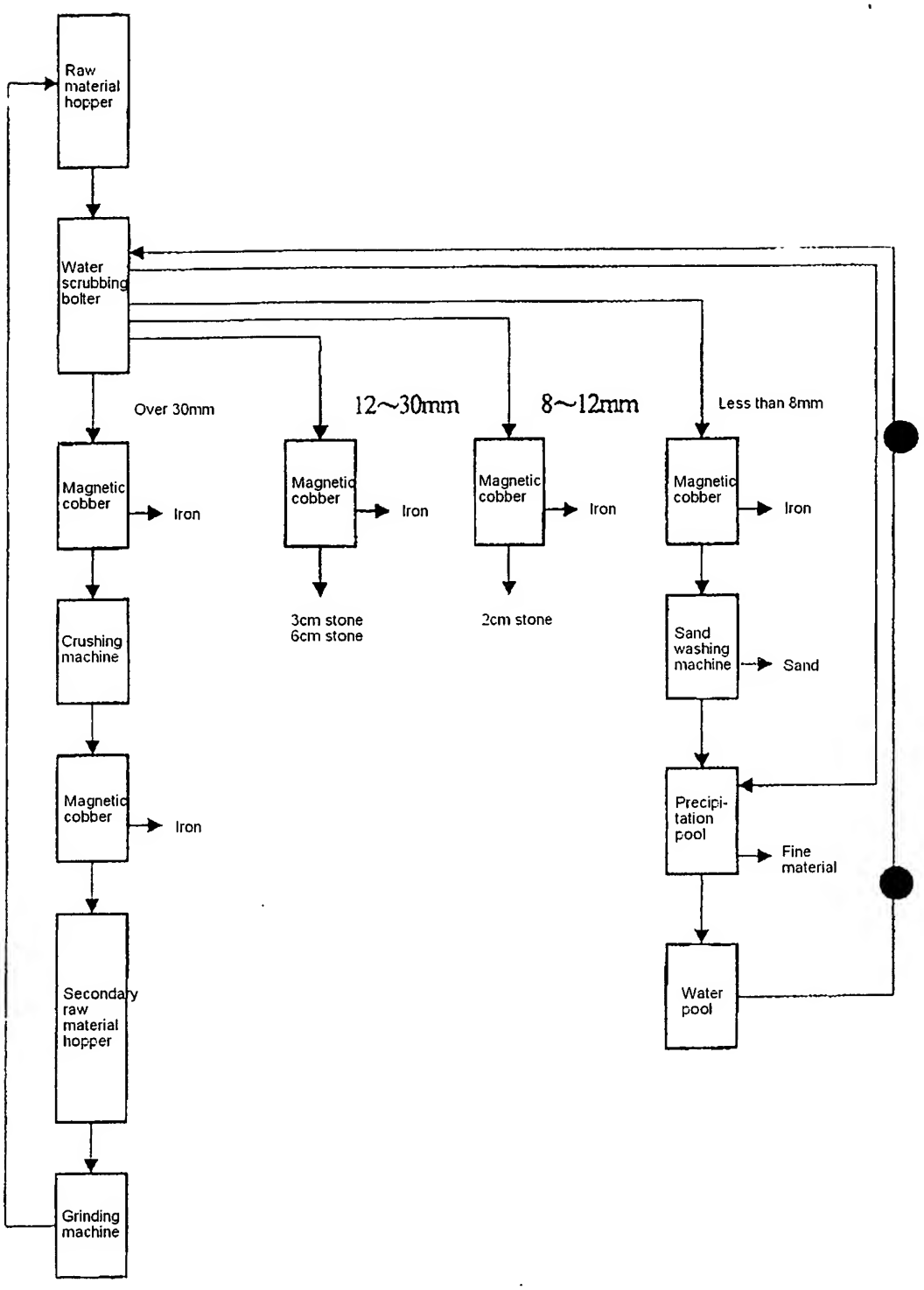
Raw material hopper
Water scrubbing bolter
Over 30mm
12~30mm
8~12mm
Less than 8mm
Magnetic cobber
Iron
Magnetic cobber
Iron
Magnetic cobber
Iron
Magnetic cobber
Iron
Crushing machine
3cm stone
6cm stone
2cm stone
Sand washing machine
Sand
Magnetic cobber
Iron
Precipi-tation pool
Fine material
Secondary raw material hopper
Water pool
Grinding machine

Figure 1

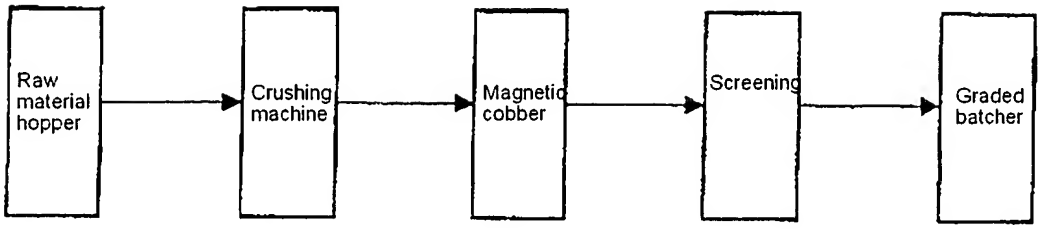

Figure 2

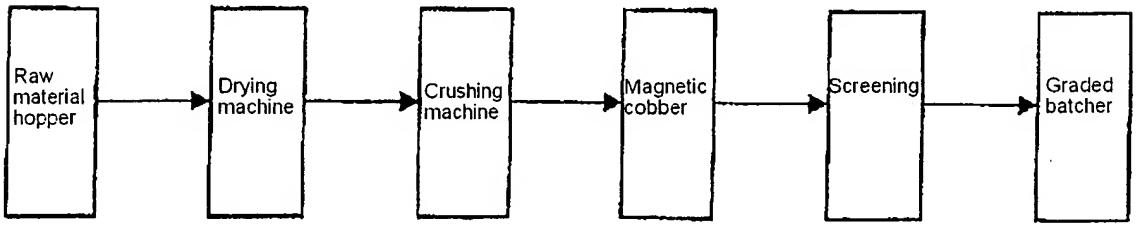

Figure 3